

Evaluation of Seated Parquetry Formboards
For Students With Low Vision

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Over the years parquetry has been given a place in both the educational and recreational activities of children. Parquetry, as represented by blocks of different size, shape, and color, has afforded children with many opportunities to compare, sequence, and discriminate among its parts, and the challenge inherent in reproducing or creating designs has certainly contributed to the appeal of parquetry as a leisure time activity.

Many versions of parquetry have been commercially produced, but for the most part they have been designed for the child with normal vision. In 1969, the Instructional Materials Reference Center of the American Printing House for the Blind (IMRC/APH) initiated a project to develop parquetry materials for the low vision student. It had been noted that when very low vision students used regular forms of parquetry, parts were easily moved out of position or temporarily misplaced. It was often the result of some random movement of a hand or arm. Some adaptations were apparently needed to structure or control the workspace.

As a result of this need for a controlled workspace, special formboards were developed to seat the regular parquetry blocks. The student could then manipulate the total workspace, hopefully avoiding undue fatigue or frustration.

It was anticipated that the materials as adapted would provide the low vision student with many opportunities to look long and closely at the stimulus materials, and additionally that the nature of the task would be attractive to the students.

Purpose

The purpose of the study was to determine the feasibility of developing formboards and stimulus materials to accompany parquetry blocks. The investigation was concerned with three general areas. These were:

(1) to determine those visually handicapped students for whom the materials would be most meaningful.

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(2) to determine the effectiveness of the materials in meeting special visual needs of the students as well as the educational objectives appropriate to their level of development.

(3) to determine the appeal of the materials or the degree to which formboards were accepted by the students and by the teachers.

Method

Materials were developed and placed in the field. As part of the field test, students from grades 1 through 12 were observed using the materials as they performed a series of prescribed tasks. Grades 1 through 3 were designated as Primary level; grades 4 through 6, Intermediate level; and grades 7 through 12, Advanced level. Instructions to the teacher-observers attempted to provide a common frame of reference regarding the purposes of the study. In order that the required observations be as consistent as possible, the observers were encouraged to become thoroughly familiar with the purpose of the study, the administration of experimental conditions, and with the two questionnaire forms designed to focus upon the observation period.

Questionnaires. The first questionnaire was related to the individual student and was designated the Student Record Form (SRF). The SRF itself was divided into two parts. Part 1 was related to the general background of the student: his grade level, IQ, mode of reading, level of academic functioning, and prior experiences with the more basic elements of geometry such as the shape and color of blocks. Part 2 of the SRF was completed during the observation period and emphasized the student's performance: his use of near vision, manipulative approach, and preferences for certain designs.

The second questionnaire was called the Teacher Observer Form (TOF) and was completed after all observations had been made. In addition to serving as the vehicle for organizing their general impressions of the materials, it also provided respondents with an opportunity to make specific recommendations for adaptations or changes.

As mentioned earlier, conditions for the try-out phase or field test were standardized as much as possible. The order of presentation for the stimulus designs was specified, and when the student was offered a choice of designs, the SRF specifically requested the order of his preferences. Introduction of the formboard occurred at a common point in the presentation, and many opportunities were present for recording student comment. In conducting the observation, teachers were instructed to provide a free or unstructured time period and to use that time for further observations of the student. The purpose of the unstructured time was to determine individual preferences for specific materials or their manipulation.

Since the target population was yet to be determined, the group of students utilized in the field test tended to be heterogeneous.

Subjects Although a total of 231 students were observed, complete background information was not made available for each student. As a result, in some of the descriptive categories the total number of students does not equal 231. Table 1 describes the subject population by grade level according to mode of reading, and prior experience with Braille. As might be expected reading comprehension of the Ss appeared to be related to their level of IQ. Table 2 provides the percentage of those reading below, at, or above grade level according to IQ classification.

Table 1

Principal Mode of Reading and Prior Experience with Braille
as Reported by Teacher-Observers

N	Grade Level	Mode of Reading			Prior Experience		
		Regular Type	Large Type	Braille	None	Limited	Extensive
96	Primary	13	63	11	73	21	0
60	Intermediate	15	37	6	30	70	0
71	Advanced	20	34	12	49	100	0
4	Special	1	2	1	2	1	0
231		49	136	30	154	68	4

Table 2

The Students' Level of Reading Comprehension According to IQ
as Reported by Teacher-Observers

Level of IQ	Percent of Students			Total
	Reading below Grade Level	Reading at Grade Level	Reading above Grade Level	
Below 85 (N = 57)	91%	9%	0%	100%
85-115 (N = 124)	44%	50%	6%	100%
Above 115 (N = 13)	3%	38%	54%	100%

Teacher-observers. A total of 31 teachers observed the 231 students who attempted the prescribed series of parquetry tasks. The teachers and their students represented three public and four residential school programs. The states represented through participating schools were: Arkansas, Florida, Kentucky, Maryland, North Carolina, Oregon, and Tennessee.

Results

One assumption underlying the use of parquetry has been that it provides the child with an opportunity to learn basic discriminations of shapes and colors. However, data based on 229 cases revealed that 166 of the Ss were already familiar with the shapes being used. Table 3 describes by grade level the 63 Ss who were unfamiliar with one or more of the shapes being used.

Table 3
The Frequency that Shapes were Reported as
Being Unfamiliar to the Student

Reported Shapes	Grade Level				
	Primary	Intermediate	Advanced	Special	Total
Square - Diamond Triangle	7	0	1	0	8
Square - Diamond	1	0	0	0	1
Triangle - Diamond	6	0	2	0	8
Square	0	0	1	0	1
Triangle	0	1	1	0	2
Diamond	24	11	4	4	43
Total	38	12	9	4	63

Parquetry activities having shape discrimination as a major objective would appear more appropriate for the primary level student. Based on the present sample, slightly less than half of the primary group were unfamiliar with one or more of the shapes being introduced. The use of these materials to learn color discriminations would seem less fruitful. Two hundred twenty-two Ss were reported as having had experience with the primary and secondary colors used, with only six reporting any unfamiliarity.

A basic educational goal, especially important to the visually handicapped child, is that of independence. A basic question of the study was concerned with the materials' contribution toward independent student activity. One aspect of the question relates to the challenging nature of the materials and their general appeal for the student. Suggested parquetry activities which emphasized more complex tasks were provided to each teacher, however the observation or evaluative phase of the study was limited to rather fundamental parquetry tasks. Apparently the students quickly understood the task that was presented to them. In the opinion of the observers 87% of the students understood the task after one trial, and the percentage reached 96% after two trials. When asked to seat the blocks in the formboard 87% understood the task after one trial and 94% understood after two trials. Table 4 provides further descriptive data concerning the Ss ability to understand the task.

Table 4

Number of Designs Presented Before Student

Understood the Nature of the Task

	Designs Presented				
	0	1	2	3	4
Under Control Condition (ie without formboard)	11	173	19	7	2
Under Experimental Condition (ie with formboard)	17	170	14	11	3

The apparent ease with which most Ss learned the task suggests that the activity could be carried out with a minimum of adult supervision. In fact, 70% of the teacher-observers felt the parquetry formboard contributed to the students' independent work skills. For the reasons stated the activity should have considerable appeal for many teachers.

Observers were also asked to make a judgment concerning the degree to which the manipulative task was eased as a result of using the formboard. The data seemed to indicate the judgments were related to the students' level

of visual functioning. In support of this notion Table 5 lists the percentage of the students in each vision category and the degree to which the formboard aided them.

Table 5
Contribution of the Formboard in Easing
the Manipulative Task

Vision Category	Degree of Contribution		
	No Contribution	Limited Contribution	Great Contribution
Ss functioning at 1-4" (N=65)	11%	32%	57%
Ss functioning at 5-10" (N=113)	18%	42%	40%
Ss functioning at 10" or more (N=45)	29%	29%	42%

It is interesting to note that although the formboard was designed to be manipulated (ie. picked up and still hold its blocks securely), the majority of students did not choose to take this option. Also it should be noted that students were specifically told that it was permissible to pick up either the card and/or the formboard in order to examine the working area more effectively. When the observed responses were analyzed beyond that of a majority response, it became apparent that those at the lowest functional levels did indeed make greater use of the pick-up option. Table 6 provides the percent of students in each vision category who picked up the stimulus diagram or the formboard.

The final phase of the investigation dealt with the appeal of the materials for the child. He was familiarized with the task and given several opportunities to work with the formboards and without them. Judgments concerning the materials' appeal have been based on the observed behaviors of the student when he was given free time to manipulate the materials. Given an opportunity to use or not to use the formboards students chose to use them in the majority of cases. One hundred forty-eight Ss or 65% of the sample chose to work with the formboard when given free time and an option to use or not use the experimental materials. When the data were classified by student characteristics, it was observed that certain groups were more likely to use the material and apparently to have greater need for it. Table 7 tends to identify the target population for the future development of such materials.

Table 6
Percent of Students Who Picked Up Materials
for Closer Examination

Vision Category	Picked Up Stimulus Diagram		
	Never	Occasionally	Often
Ss functioning at 1-4" (N=65)	26%	49%	25%
Ss functioning at 5-10" (N=112)	60%	32%	8%
Ss functioning at 10" or more (N=47)	96%	4%	0%
	Picked Up Formboard		
	Never	Occasionally	Often
Ss functioning at 1-4" (N=60)	47%	38%	15%
Ss functioning at 5-10" (N=109)	82%	14%	4%
Ss functioning at 10" or more (N=47)	96%	4%	0%

Table 7
Percent of Students by Category Who Chose
Control or Experimental Condition

Choice of Condition	Level of IQ (N=215)			
	Below 85	85-115	Above 115	Total
Control	6%	22%	5%	33%
Experimental	25%	40%	2%	67%

	Mode of Reading (N=221)			
	Braille	Large Type	Regular Type	Total
Control	5%	20%	9%	34%
Experimental	9%	42%	15%	66%

	Visual Efficiency (N=223)			
	1-4"	5-10"	Over 10"	Total
Control	8%	20%	8%	36%
Experimental	21%	30%	13%	64%

	Grade Level (N=223)			
	Primary	Intermediate	Advanced	Total
Control	13%	8%	14%	35%
Experimental	30%	19%	16%	65%

One question asked the contribution of the formboard toward the creative effort of the students. Responses were mixed, 8 observers felt creative effort was enhanced, and 7 felt it was hampered. The remaining 13 observers had no comment.

Students of average IQ and below elected to work with the formboard more often than the high IQ group. It seems that the stimulus diagrams may not have offered a sufficient challenge for this group. However, activities have been suggested that can increase difficulty appreciably.

Students who read large type or braille and held their work within 10" were more apt to select the formboard for their parquetry activity. It also seems apparent that the materials would be most appropriate for grades 1 through 6.

Discussion

The feasibility of producing adapted parquetry materials for visually handicapped children depends in some part on the market potential for such materials. The teachers who had observed their students using the materials were asked if they would purchase them if they were available. Of the 29 observers who responded to this question, 14 answered yes and 15 responded no. Since the primary and intermediate levels seem to be the more appropriate target populations, a breakdown was made of the teachers who observed these particular students. Table 8 presents these results.

Table 8

Teacher Survey of Those Who would Buy Materials

	Yes would buy	No would not buy
Teachers who observed <u>Ss</u> in Grades 1-3	7	5
Teachers who observed <u>Ss</u> in Grades 1-6	1	0
Teachers who observed <u>Ss</u> in Grades 4-6	4	2
Teachers who observed <u>Ss</u> in Grades 7-12	0	4
Teachers who observed <u>Ss</u> in Grades 1-12	2	2
Teachers who observed <u>Ss</u> in Special Grades		2
Total	14	15

The majority of those who observed elementary and intermediate grade students apparently did see a potential benefit from working with these types of materials. While some of the teachers would buy the materials "as is" their responses to specific questions and their comments would indicate that some changes would be highly desirable. Anticipating that some revisions would be made, a series of questions dealt with establishing some guidelines for future development of parquetry design and the sequential arrangement of tasks.

Teachers were asked, "Which of the following appeared to contribute to the difficulty of the task?" Twenty-eight responded to one or more of the following descriptions: colors used 11, shapes used 11, number of blocks 5, size of blocks 3, design used 14, and failure of the blocks to fit properly 19. The development of future materials must certainly insure that all pieces fit properly. Secondly it appears that manipulations of the design requiring different shapes and colors can be used to approximate levels of difficulty.

As part of the observation, students were given a choice in selecting four of the designs they would like to attempt. Design #8 was chosen first by 75 of the students. Following in order of preference were #6, #5, and #7. Design #7 was chosen first by only 19 students. While #8, the starburst design, was popular with the students it was deemed the most difficult by the observers. It required that the pieces fit together exactly and it may have been this feature that brought about its high rating of difficulty. Observers were asked to rank the eight designs for difficulty. Results indicate that design #1 was chosen easiest by 16 of the teachers, and #3 was selected as the most difficult by 20 of the respondents. After analyzing the designs the results were not surprising. Design #1 was made up of four squares and two right triangles, in red and blue. Parts were generally familiar to all groups and in no case were the pieces required to fit together. In the starburst, design #8, the colors were purple and green, and the pieces were diamonds and triangles having an obtuse angle. The colors were two of the more difficult for the students to see, and the shapes were two of the more unfamiliar. Most importantly a high degree of precision was necessary for the pieces to fit together properly.

The question of durability did not seem to be a factor in any preferences expressed by the teachers. Twenty-five said the materials were sufficiently durable while only three reported any deficiency. Of the three, two reported chipping and one fading of colors.

Other comments of the teacher-observers will be used in further development of the materials. The frequency with which suggestions appeared were tabulated. Results appear in Table 9.

Table 9
Frequency of Suggestions for Adapting Materials

Suggestion	Frequency
fewer blocks	10
greater variety of shapes	8
fewer colors	6
greater variety of color	2
more blocks	2

Summary

The field test was conducted using a relatively large and diverse population of students. Although the evaluation was dependent upon the judgment of individual teachers, the responses received indicated a high degree of interest and cooperation.

Purposes of the study were achieved. The materials were more readily accepted by students having lesser amounts of vision, and the formboards were duly noted as easing the manipulative task of the student. Level of IQ may have been a factor, but the large proportion of students tested readily used the materials in their field test form. Several suggestions have focused upon ways of making the designs more challenging which should aid in interesting students of any intellectual level.

The target population was also identified as being within the elementary grades. The activity was felt to contribute to the development of independent work habits and of primary importance it required students to actively use their vision for periods of 20 to 30 minutes. A description of attending behavior was not specifically requested, but no comments were forthcoming concerning the materials inability to hold the child's attention for the required trial period of approximately 30 minutes.